



## SEQUENCE LISTING

<110> KATO, MASARU  
MIURA, YUTAKA  
KETTOKU, MASAKO  
IWAMATSU, AKIHIRO  
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KOMEDA, TOSHIHIRO

<120> NOVEL TRANSFERASE AND AMYLASE, PROCESS FOR PRODUCING  
THE ENZYMES, USE THEREOF, AND GENE CODING FOR THE SAME

<130> 049441/0124

<140> 09/695,423

<141> 2000-10-25

<150> 09/298,924

<151> 1999-04-26

<150> 08/750,569

<151> 1997-02-24

<150> PCT/JP95/01189

<151> 1995-06-14

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<151> 1994-10-31

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<151> 1994-08-18

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<170> PatentIn Ver. 2.1

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JAN 30 2003

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tat aag gga tta gat cta gaa gaa gga cta tgt ggg ttt att agg ttt	2705
Tyr Lys Gly Leu Asp Leu Glu Glu Gly Leu Cys Gly Phe Ile Arg Phe	
615 620 625 630	
aac aaa att ttg gta ata ata aaa acc aag gga agt gtt aat tac aaa	2753
Asn Lys Ile Leu Val Ile Ile Lys Thr Lys Gly Ser Val Asn Tyr Lys	
635 640 645	
ctg aaa ctt gaa gag gga gca att tac aca gat gta ttg aca gga gaa	2801
Leu Lys Leu Glu Glu Gly Ala Ile Tyr Thr Asp Val Leu Thr Gly Glu	
650 655 660	
gaa att aaa aaa gag gta cag att aat gag cta cct agg ata cta gtt	2849
Glu Ile Lys Lys Glu Val Gln Ile Asn Glu Leu Pro Arg Ile Leu Val	
665 670 675	
aga atg taagttataa taatccgatt tttatgtgac aagatttacg cttacgaaaa	2905
Arg Met	
680	
ggactgttaa atcaactttt atgtgaatta tgaaacgtaa attataagtt tcctgaggat	2965
aaacatatat atctctatct ctcatgata tcacatgagt attagattaa ggggaagtaa	3025
ttcttacgga cattcaggct ggtttacagt atactgtaga atatgtaata ggaaaaataag	3085
aataggaacg gacttagtct acaaatgcc taaatgtgaa aagaagtata acgcattctt	3145
ctgtgaagca gatgctaggg gattaaagaa aaagtgccca tactgtggta ctgaacttgt	3205

cagtgcatt taagactcaa atagaaggta aaaatatttt tatactgaat aatgagttgt 3265  
 tttacgctga tacggatata gttattcgaa atcaagattt tattaagaaa ctcaccttta 3325  
 cacaatataa taagattgcc tatattgaca tggacataga aacgacagaa ttttaagatat 3385  
 taagattagt agtgtgtaaa actagaataa atatttatgt ttgcaacgta attggtaaatt 3445  
 tgaaagaaac taattttgaa aa 3467

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 <212> PRT  
 <213> Sulfolobus acidocaldarius

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 Glu Thr Ala His Thr Ile Gly Leu Gly Ile Ile Gln Asp Ile Val Pro  
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 Asn His Met Ala Val Asn Ser Leu Asn Trp Arg Leu Met Asp Val Leu  
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 Lys Met Gly Lys Lys Ser Lys Tyr Tyr Thr Tyr Phe Asp Phe Phe Pro  
 65 70 75 80  
 Glu Asp Asp Lys Ile Arg Leu Pro Ile Leu Gly Glu Asp Leu Asp Thr  
 85 90 95  
 Val Ile Ser Lys Gly Leu Leu Lys Ile Val Lys Asp Gly Asp Glu Tyr  
 100 105 110  
 Phe Leu Glu Tyr Phe Lys Trp Lys Leu Pro Leu Thr Glu Val Gly Asn  
 115 120 125  
 Asp Ile Tyr Asp Thr Leu Gln Lys Gln Asn Tyr Thr Leu Met Ser Trp  
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 Lys Asn Pro Pro Ser Tyr Arg Arg Phe Phe Asp Val Asn Thr Leu Ile  
 145 150 155 160  
 Gly Val Asn Val Glu Lys Asp His Val Phe Gln Glu Ser His Ser Lys  
 165 170 175  
 Ile Leu Asp Leu Asp Val Asp Gly Tyr Arg Ile Asp His Ile Asp Gly  
 180 185 190  
 Leu Tyr Asp Pro Glu Lys Tyr Ile Asn Asp Leu Arg Ser Ile Ile Lys  
 195 200 205  
 Asn Lys Ile Ile Ile Val Glu Lys Ile Leu Gly Phe Gln Glu Glu Leu  
 210 215 220

Lys Leu Asn Ser Asp Gly Thr Thr Gly Tyr Asp Phe Leu Asn Tyr Ser  
 225 230 235 240  
 Asn Leu Leu Phe Asn Phe Asn Gln Glu Ile Met Asp Ser Ile Tyr Glu  
 245 250 255  
 Asn Phe Thr Ala Glu Lys Ile Ser Ile Ser Glu Ser Ile Lys Lys Ile  
 260 265 270  
 Lys Ala Gln Ile Ile Asp Glu Leu Phe Ser Tyr Glu Val Lys Arg Leu  
 275 280 285  
 Ala Ser Gln Leu Gly Ile Ser Tyr Asp Ile Leu Arg Asp Tyr Leu Ser  
 290 295 300  
 Cys Ile Asp Val Tyr Arg Thr Tyr Ala Asn Gln Ile Val Lys Glu Cys  
 305 310 315 320  
 Asp Lys Thr Asn Glu Ile Glu Glu Ala Thr Lys Arg Asn Pro Glu Ala  
 325 330 335  
 Tyr Thr Lys Leu Gln Gln Tyr Met Pro Ala Val Tyr Ala Lys Ala Tyr  
 340 345 350  
 Glu Asp Thr Phe Leu Phe Arg Tyr Asn Arg Leu Ile Ser Ile Asn Glu  
 355 360 365  
 Val Gly Ser Asp Leu Arg Tyr Tyr Lys Ile Ser Pro Asp Gln Phe His  
 370 375 380  
 Val Phe Asn Gln Lys Arg Arg Gly Lys Ile Thr Leu Asn Ala Thr Ser  
 385 390 395 400  
 Thr His Asp Thr Lys Phe Ser Glu Asp Val Arg Met Lys Ile Ser Val  
 405 410 415  
 Leu Ser Glu Phe Pro Glu Glu Trp Lys Asn Lys Val Glu Glu Trp His  
 420 425 430  
 Ser Ile Ile Asn Pro Lys Val Ser Arg Asn Asp Glu Tyr Arg Tyr Tyr  
 435 440 445  
 Gln Val Leu Val Gly Ser Phe Tyr Glu Gly Phe Ser Asn Asp Phe Lys  
 450 455 460  
 Glu Arg Ile Lys Gln His Met Ile Lys Ser Val Arg Glu Ala Lys Ile  
 465 470 475 480  
 Asn Thr Ser Trp Arg Asn Gln Asn Lys Glu Tyr Glu Asn Arg Val Met  
 485 490 495  
 Glu Leu Val Glu Glu Thr Phe Thr Asn Lys Asp Phe Ile Lys Ser Phe  
 500 505 510  
 Met Lys Phe Glu Ser Lys Ile Arg Arg Ile Gly Met Ile Lys Ser Leu  
 515 520 525

Ser Leu Val Ala Leu Lys Ile Met Ser Ala Gly Ile Pro Asp Phe Tyr  
 530 535 540  
 Gln Gly Thr Glu Ile Trp Arg Tyr Leu Leu Thr Asp Pro Asp Asn Arg  
 545 550 555 560  
 Val Pro Val Asp Phe Lys Lys Leu His Glu Ile Leu Glu Lys Ser Lys  
 565 570 575  
 Lys Phe Glu Lys Asn Met Leu Glu Ser Met Asp Asp Gly Arg Ile Lys  
 580 585 590  
 Met Tyr Leu Thr Tyr Lys Leu Leu Ser Leu Arg Lys Gln Leu Ala Glu  
 595 600 605  
 Asp Phe Leu Lys Gly Glu Tyr Lys Gly Leu Asp Leu Glu Glu Gly Leu  
 610 615 620  
 Cys Gly Phe Ile Arg Phe Asn Lys Ile Leu Val Ile Ile Lys Thr Lys  
 625 630 635 640  
 Gly Ser Val Asn Tyr Lys Leu Lys Leu Glu Glu Gly Ala Ile Tyr Thr  
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<220>  
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 gcagaggtaa acccatgaat gtcattttcg acgtattaaa cgagatccat gggtttttttg 180  
 gtgcattgtg ggcgggagca gctctactta actacttagt taagcctcaa gataagaggc 240  
 aatttgagag aatagggaaa ttcttcatga taaactcagt cattacagta ataactggga 300  
 taataatttt cgcctacatt tacctagccc cttatcaagg gaattttattt ctagtagcgg 360  
 caattctacg ttcaagcctt gacattaggt taagggcctt actaaactta ataggaggag 420  
 cgtttggtt attggctttt ggggcaggga tagttataag caataggata aggcttatgg 480  
 tacgtgttaa ggaaggtgac gctacaatcc tagagttgag gaatagtatt gccaatattat 540

ctaaaattag tttaatcttc ttattacttt ccttagccat gatgatactt gctgggtcca 600

tagcacaagt tataagtttag agttgaaaga aaaattta atg acg ttt gct tat aaa 656  
Met Thr Phe Ala Tyr Lys  
1 5

ata gat gga aat gag gta atc ttt acc tta tgg gca cct tat caa aag 704  
Ile Asp Gly Asn Glu Val Ile Phe Thr Leu Trp Ala Pro Tyr Gln Lys  
10 15 20

agc gtt aaa cta aag gtt cta gag aag gga ctt tac gaa atg gaa aga 752  
Ser Val Lys Leu Lys Val Leu Glu Lys Gly Leu Tyr Glu Met Glu Arg  
25 30 35

gat gaa aaa ggt tac ttc acc att acc tta aac aac gta aag gtt aga 800  
Asp Glu Lys Gly Tyr Phe Thr Ile Thr Leu Asn Asn Val Lys Val Arg  
40 45 50

gat agg tat aaa tac gtt tta gat gat gct agt gaa ata cca gat cca 848  
Asp Arg Tyr Lys Tyr Val Leu Asp Asp Ala Ser Glu Ile Pro Asp Pro  
55 60 65 70

gca tcc aga tac caa cca gaa ggt gta cat ggg cct tca caa att ata 896  
Ala Ser Arg Tyr Gln Pro Glu Gly Val His Gly Pro Ser Gln Ile Ile  
75 80 85

caa gaa agt aaa gag ttc aac aac gag act ttt ctg aag aaa gag gac 944  
Gln Glu Ser Lys Glu Phe Asn Asn Glu Thr Phe Leu Lys Lys Glu Asp  
90 95 100

ttg ata att tat gaa ata cac gtg ggg act ttc act cca gag gga acg 992  
Leu Ile Ile Tyr Glu Ile His Val Gly Thr Phe Thr Pro Glu Gly Thr  
105 110 115

ttt gag gga gtg ata agg aaa ctt gac tac tta aag gat ttg gga att 1040  
Phe Glu Gly Val Ile Arg Lys Leu Asp Tyr Leu Lys Asp Leu Gly Ile  
120 125 130

acg gca ata gag ata atg cca ata gct caa ttt cct ggg aaa agg gat 1088  
Thr Ala Ile Glu Ile Met Pro Ile Ala Gln Phe Pro Gly Lys Arg Asp  
135 140 145 150

tgg ggt tat gat gga gtt tat tta tat gca gta cag aac tct tac gga 1136  
Trp Gly Tyr Asp Gly Val Tyr Leu Tyr Ala Val Gln Asn Ser Tyr Gly  
155 160 165

ggg cca gaa ggt ttt aga aag tta gtt gat gaa gcg cac aag aaa ggt 1184  
Gly Pro Glu Gly Phe Arg Lys Leu Val Asp Glu Ala His Lys Lys Gly  
170 175 180

tta gga gtt att tta gac gta gta tac aac cac gtt gga cca gag gga 1232  
Leu Gly Val Ile Leu Asp Val Val Tyr Asn His Val Gly Pro Glu Gly  
185 190 195

aac tat atg gtt aaa ttg ggg cca tat ttc tca cag aaa tac aaa acg 1280  
Asn Tyr Met Val Lys Leu Gly Pro Tyr Phe Ser Gln Lys Tyr Lys Thr  
200 205 210





caa ggt gta agg gaa ggg aga aaa aag gaa aac ggg caa gat act gac 2000  
 Gln Gly Val Arg Glu Gly Arg Lys Lys Glu Asn Gly Gln Asp Thr Asp  
 440 445 450

cct caa gat gaa tca act ttt aac gct tcc aaa ctg agt tgg aag att 2048  
 Pro Gln Asp Glu Ser Thr Phe Asn Ala Ser Lys Leu Ser Trp Lys Ile  
 455 460 465 470

gac gag gaa atc ttt tca ttt tac aag att tta ata aaa atg aga aag 2096  
 Asp Glu Glu Ile Phe Ser Phe Tyr Lys Ile Leu Ile Lys Met Arg Lys  
 475 480 485

gag ttg agc ata gcg tgt gat agg aga gta aac gtc gtg aat ggc gaa 2144  
 Glu Leu Ser Ile Ala Cys Asp Arg Arg Val Asn Val Val Asn Gly Glu  
 490 495 500

aat tgg ttg atc atc aag gga aga gaa tac ttt tca ctc tac gtt ttc 2192  
 Asn Trp Leu Ile Ile Lys Gly Arg Glu Tyr Phe Ser Leu Tyr Val Phe  
 505 510 515

tct aaa tca tct att gaa gtt aag tac agt gga act tta ctt ttg tcc 2240  
 Ser Lys Ser Ser Ile Glu Val Lys Tyr Ser Gly Thr Leu Leu Leu Ser  
 520 525 530

tca aat aat tca ttc cct cag cat att gaa gaa ggt aaa tat gag ttt 2288  
 Ser Asn Asn Ser Phe Pro Gln His Ile Glu Glu Gly Lys Tyr Glu Phe  
 535 540 545 550

gat aag gga ttt gct tta tat aaa ctt taggacagga gagtttaaaa 2335  
 Asp Lys Gly Phe Ala Leu Tyr Lys Leu  
 555

atttctatga atgattatac tttagatgat gagtaaaagc aagatcgatg aggaagagaa 2395

aaggagaaga gaagaagtca aaaagttagt aatgctctta gcaatgttaa gataatgttt 2455

ttttaaactc aaataataat aaataccatc atgtcaatat tcttcagaac tagagataga 2515

cctttacgtc ccggagatcc gtatccatta ggttcaaatt ggatagaaga tgaggatggc 2575

gtaaattttt ccttgttctc agagaatgca gacaaagtgg agttgattct ttattcacaa 2635

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 <212> PRT  
 <213> Sulfolobus solfataricus

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Tyr Glu Met Glu Arg Asp Glu Lys Gly Tyr Phe Thr Ile Thr Leu Asn  
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 Asn Val Lys Val Arg Asp Arg Tyr Lys Tyr Val Leu Asp Asp Ala Ser  
           50                                  55                                  60  
 Glu Ile Pro Asp Pro Ala Ser Arg Tyr Gln Pro Glu Gly Val His Gly  
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 Pro Ser Gln Ile Ile Gln Glu Ser Lys Glu Phe Asn Asn Glu Thr Phe  
                                   85                                  90                                  95  
 Leu Lys Lys Glu Asp Leu Ile Ile Tyr Glu Ile His Val Gly Thr Phe  
                                   100                                  105                                  110  
 Thr Pro Glu Gly Thr Phe Glu Gly Val Ile Arg Lys Leu Asp Tyr Leu  
                   115                                  120                                  125  
 Lys Asp Leu Gly Ile Thr Ala Ile Glu Ile Met Pro Ile Ala Gln Phe  
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 Pro Gly Lys Arg Asp Trp Gly Tyr Asp Gly Val Tyr Leu Tyr Ala Val  
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 Gln Asn Ser Tyr Gly Gly Pro Glu Gly Phe Arg Lys Leu Val Asp Glu  
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 Ala His Lys Lys Gly Leu Gly Val Ile Leu Asp Val Val Tyr Asn His  
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 Val Gly Pro Glu Gly Asn Tyr Met Val Lys Leu Gly Pro Tyr Phe Ser  
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 Gln Lys Tyr Lys Thr Pro Trp Gly Leu Thr Phe Asn Phe Asp Asp Ala  
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 Glu Ser Asp Glu Val Arg Lys Phe Ile Leu Glu Asn Val Glu Tyr Trp  
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 Ile Lys Glu Tyr Asn Val Asp Gly Phe Arg Leu Asp Ala Val His Ala  
                                   245                                  250                                  255  
 Ile Ile Asp Thr Ser Pro Lys His Ile Leu Glu Glu Ile Ala Asp Val  
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 Val His Lys Tyr Asn Arg Ile Val Ile Ala Glu Ser Asp Leu Asn Asp  
                   275                                  280                                  285  
 Pro Arg Val Val Asn Pro Lys Glu Lys Cys Gly Tyr Asn Ile Asp Ala  
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 Gln Trp Val Asp Asp Phe His His Ser Ile His Ala Tyr Leu Thr Gly  
   305                                  310                                  315                                  320  
 Glu Arg Gln Gly Tyr Tyr Thr Asp Phe Gly Asn Leu Asp Asp Ile Val  
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Lys Ser Tyr Lys Asp Val Phe Val Tyr Asp Gly Lys Tyr Ser Asn Phe  
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 Arg Arg Lys Thr His Gly Glu Pro Val Gly Glu Leu Asp Gly Cys Asn  
 355 360 365  
 Phe Val Val Tyr Ile Gln Asn His Asp Gln Val Gly Asn Arg Gly Lys  
 370 375 380  
 Gly Glu Arg Ile Ile Lys Leu Val Asp Arg Glu Ser Tyr Lys Ile Ala  
 385 390 395 400  
 Ala Ala Leu Tyr Leu Leu Ser Pro Tyr Ile Pro Met Ile Phe Met Gly  
 405 410 415  
 Glu Glu Tyr Gly Glu Glu Asn Pro Phe Tyr Phe Phe Ser Asp Phe Ser  
 420 425 430  
 Asp Ser Lys Leu Ile Gln Gly Val Arg Glu Gly Arg Lys Lys Glu Asn  
 435 440 445  
 Gly Gln Asp Thr Asp Pro Gln Asp Glu Ser Thr Phe Asn Ala Ser Lys  
 450 455 460  
 Leu Ser Trp Lys Ile Asp Glu Glu Ile Phe Ser Phe Tyr Lys Ile Leu  
 465 470 475 480  
 Ile Lys Met Arg Lys Glu Leu Ser Ile Ala Cys Asp Arg Arg Val Asn  
 485 490 495  
 Val Val Asn Gly Glu Asn Trp Leu Ile Ile Lys Gly Arg Glu Tyr Phe  
 500 505 510  
 Ser Leu Tyr Val Phe Ser Lys Ser Ser Ile Glu Val Lys Tyr Ser Gly  
 515 520 525  
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<211> 3600

<212> DNA

<213> *Sulfolobus acidocaldarius*

<220>

<221> CDS

<222> (1176)..(2843)

<400> 7

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gcactaactc	cgagctccgc	gagtttagta	gtcacgaatt	tgcgtacata	tttcggcgct	180										
atccctttct	catgcaataa	attcttcgcg	tagttgtacg	ttatatcagt	cttagctata	240										
gacgaaatgt	gaaagacata	gaacactttc	tttggccctc	tagtccagtt	gagcgtgtat	300										
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gcctccctaa	gccttatacc	gctctcaagg	aggagcttga	agactagctc	tacctcaata	420										
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Asn	Ile	Glu	Lys	Asn	Lys	Gly	Ile	Phe	Lys	Leu	Trp	Ala	Pro	Tyr	Val	
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Asn	Ser	Val	Lys	Leu	Lys	Leu	Ser	Lys	Lys	Leu	Ile	Pro	Met	Glu	Lys	
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Asn	Asp	Glu	Gly	Phe	Phe	Glu	Val	Glu	Ile	Asp	Asp	Ile	Glu	Glu	Asn	
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tta	acc	tat	tct	tat	att	ata	gaa	gat	aag	aga	gag	ata	cct	gat	ccc	1385
Leu	Thr	Tyr	Ser	Tyr	Ile	Ile	Glu	Asp	Lys	Arg	Glu	Ile	Pro	Asp	Pro	
					60					65					70	
gca	tca	cga	tat	caa	cct	tta	gga	gtt	cat	gac	aaa	tca	caa	ctt	ata	1433
Ala	Ser	Arg	Tyr	Gln	Pro	Leu	Gly	Val	His	Asp	Lys	Ser	Gln	Leu	Ile	
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aga aca gat tat cag att ctt gac ctt gga aaa gta aaa ata gaa gat	1481
Arg Thr Asp Tyr Gln Ile Leu Asp Leu Gly Lys Val Lys Ile Glu Asp	
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cta ata ata tat gaa ctc cac gtt ggt act ttt tcc caa gaa gga aat	1529
Leu Ile Ile Tyr Glu Leu His Val Gly Thr Phe Ser Gln Glu Gly Asn	
105 110 115	
ttc aaa gga gta ata gaa aag tta gat tac ctc aag gat cta gga atc	1577
Phe Lys Gly Val Ile Glu Lys Leu Asp Tyr Leu Lys Asp Leu Gly Ile	
120 125 130	
aca gga att gaa ctg atg cct gtg gca caa ttt cca ggg aat aga gat	1625
Thr Gly Ile Glu Leu Met Pro Val Ala Gln Phe Pro Gly Asn Arg Asp	
135 140 145 150	
tgg gga tac gat ggt gtt ttt cta tac gca gtt caa aat act tat ggc	1673
Trp Gly Tyr Asp Gly Val Phe Leu Tyr Ala Val Gln Asn Thr Tyr Gly	
155 160 165	
gga cca tgg gaa ttg gct aag cta gta aac gag gca cat aaa agg gga	1721
Gly Pro Trp Glu Leu Ala Lys Leu Val Asn Glu Ala His Lys Arg Gly	
170 175 180	
ata gcc gta att ttg gat gtt gta tat aat cat ata ggt cct gag gga	1769
Ile Ala Val Ile Leu Asp Val Val Tyr Asn His Ile Gly Pro Glu Gly	
185 190 195	
aat tac ctt tta gga tta ggt cct tat ttt tca gac aga tat aaa act	1817
Asn Tyr Leu Leu Gly Leu Gly Pro Tyr Phe Ser Asp Arg Tyr Lys Thr	
200 205 210	
cca tgg gga tta aca ttt aat ttt gat gat agg gga tgt gat caa gtt	1865
Pro Trp Gly Leu Thr Phe Asn Phe Asp Asp Arg Gly Cys Asp Gln Val	
215 220 225 230	
aga aaa ttc att tta gaa aat gtc gag tat tgg ttt aag acc ttt aaa	1913
Arg Lys Phe Ile Leu Glu Asn Val Glu Tyr Trp Phe Lys Thr Phe Lys	
235 240 245	
atc gat ggt ctg aga ctg gat gca gtt cat gca att ttt gat aat tcg	1961
Ile Asp Gly Leu Arg Leu Asp Ala Val His Ala Ile Phe Asp Asn Ser	
250 255 260	
cct aag cat atc ctc caa gag ata gct gaa aaa gcc cat caa tta gga	2009
Pro Lys His Ile Leu Gln Glu Ile Ala Glu Lys Ala His Gln Leu Gly	
265 270 275	
aaa ttt gtt att gct gaa agt gat tta aat gat cca aaa ata gta aaa	2057
Lys Phe Val Ile Ala Glu Ser Asp Leu Asn Asp Pro Lys Ile Val Lys	
280 285 290	
gat gat tgt gga tat aaa ata gat gct caa tgg gtt gac gat ttc cac	2105
Asp Asp Cys Gly Tyr Lys Ile Asp Ala Gln Trp Val Asp Asp Phe His	
295 300 305 310	

cac gca gtt cat gca ttc ata aca aaa gaa aaa gat tat tat tac cag	2153
His Ala Val His Ala Phe Ile Thr Lys Glu Lys Asp Tyr Tyr Tyr Gln	
315 320 325	
gat ttt gga agg ata gaa gat ata gag aaa act ttt aaa gat gtt ttt	2201
Asp Phe Gly Arg Ile Glu Asp Ile Glu Lys Thr Phe Lys Asp Val Phe	
330 335 340	
gtt tat gat gga aag tat tct aga tac aga gga aga act cat ggt gct	2249
Val Tyr Asp Gly Lys Tyr Ser Arg Tyr Arg Gly Arg Thr His Gly Ala	
345 350 355	
cct gta ggt gat ctt cca cca cgt aaa ttt gta gtc ttc ata caa aat	2297
Pro Val Gly Asp Leu Pro Pro Arg Lys Phe Val Val Phe Ile Gln Asn	
360 365 370	
cac gat caa gta gga aat aga gga aat ggg gaa aga ctt tcc ata tta	2345
His Asp Gln Val Gly Asn Arg Gly Asn Gly Glu Arg Leu Ser Ile Leu	
375 380 385 390	
acc gat aaa acg aca tac ctt atg gca gcc aca cta tat ata ctc tca	2393
Thr Asp Lys Thr Thr Tyr Leu Met Ala Ala Thr Leu Tyr Ile Leu Ser	
395 400 405	
ccg tat ata ccg cta ata ttt atg ggc gag gaa tat tat gag acg aat	2441
Pro Tyr Ile Pro Leu Ile Phe Met Gly Glu Glu Tyr Tyr Glu Thr Asn	
410 415 420	
cct ttt ttc ttc ttc tct gat ttc tca gat ccc gta tta att aag ggt	2489
Pro Phe Phe Phe Phe Ser Asp Phe Ser Asp Pro Val Leu Ile Lys Gly	
425 430 435	
gtt aga gaa ggt aga cta aag gaa aat aat caa atg ata gat cca caa	2537
Val Arg Glu Gly Arg Leu Lys Glu Asn Asn Gln Met Ile Asp Pro Gln	
440 445 450	
tct gag gaa gcg ttc tta aag agt aaa ctt tca tgg aaa att gat gag	2585
Ser Glu Glu Ala Phe Leu Lys Ser Lys Leu Ser Trp Lys Ile Asp Glu	
455 460 465 470	
gaa gtt tta gat tat tat aaa caa ctg ata aat atc aga aag aga tat	2633
Glu Val Leu Asp Tyr Tyr Lys Gln Leu Ile Asn Ile Arg Lys Arg Tyr	
475 480 485	
aat aat tgt aaa agg gta aag gaa gtt agg aga gaa ggg aac tgt att	2681
Asn Asn Cys Lys Arg Val Lys Glu Val Arg Arg Glu Gly Asn Cys Ile	
490 495 500	
act ttg atc atg gaa aaa ata gga ata att gca tcg ttt gat gat att	2729
Thr Leu Ile Met Glu Lys Ile Gly Ile Ile Ala Ser Phe Asp Asp Ile	
505 510 515	
gta att aat tct aaa att aca ggt aat tta ctt ata ggc ata gga ttt	2777
Val Ile Asn Ser Lys Ile Thr Gly Asn Leu Leu Ile Gly Ile Gly Phe	
520 525 530	

ccg aaa aaa ttg aaa aaa gat gaa tta att aag gtt aac aga ggt gtt 2825  
 Pro Lys Lys Leu Lys Lys Asp Glu Leu Ile Lys Val Asn Arg Gly Val  
 535 540 545 550

ggg gta tat caa tta gaa tgaaagatcg accattaaag cctggtgaac 2873  
 Gly Val Tyr Gln Leu Glu  
 555

cttatccttt aggggcaact tggatagagg aagaagatgg agttaatttt gtactattct 2933  
 ctgagaacgc cacaaaagta gaactgtaa cgtactctca gactagacaa gatgagccaa 2993  
 aggaaataat agaacttaga cagagaaccg gagatctctg gcatgttttt gtacctggtt 3053  
 taagaccagg tcagttgtat gggtagagg tgtatgggtcc atataaacca gaggaagggt 3113  
 taaggtttaa tcctaataaa gtactgatag atccttatgc aaaagctata aacggattat 3173  
 tactatggga tgattcggtc tttggatata aaattggaga tcagaaccag gatctcagtt 3233  
 tcgatgagag aaaagacgat aaatttatac ctaaaggggt cataataaat ccttattttg 3293  
 attgggagga cgagcatttc ttctttagaa gaaagatacc ttttaaggat agtataattt 3353  
 atgagacaca tataaaaagga ataactaaat taaggcaaga tttaccggag aacgtagag 3413  
 gcactttttt ggggttagca tcagatacta tgattgatta cctaaaagat ttaggaatta 3473  
 caaccgttga gataatgcct attcagcaat ttgtagatga gagattcatt gtcgataaag 3533  
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 caagctc 3600

<210> 8  
 <211> 556  
 <212> PRT  
 <213> Sulfolobus acidocaldarius

<400> 8  
 Met Phe Ser Phe Gly Gly Asn Ile Glu Lys Asn Lys Gly Ile Phe Lys  
 1 5 10 15  
 Leu Trp Ala Pro Tyr Val Asn Ser Val Lys Leu Lys Leu Ser Lys Lys  
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 Leu Ile Pro Met Glu Lys Asn Asp Glu Gly Phe Phe Glu Val Glu Ile  
 35 40 45  
 Asp Asp Ile Glu Glu Asn Leu Thr Tyr Ser Tyr Ile Ile Glu Asp Lys  
 50 55 60  
 Arg Glu Ile Pro Asp Pro Ala Ser Arg Tyr Gln Pro Leu Gly Val His  
 65 70 75 80  
 Asp Lys Ser Gln Leu Ile Arg Thr Asp Tyr Gln Ile Leu Asp Leu Gly  
 85 90 95

Lys Val Lys Ile Glu Asp Leu Ile Ile Tyr Glu Leu His Val Gly Thr  
 100 105 110  
 Phe Ser Gln Glu Gly Asn Phe Lys Gly Val Ile Glu Lys Leu Asp Tyr  
 115 120 125  
 Leu Lys Asp Leu Gly Ile Thr Gly Ile Glu Leu Met Pro Val Ala Gln  
 130 135 140  
 Phe Pro Gly Asn Arg Asp Trp Gly Tyr Asp Gly Val Phe Leu Tyr Ala  
 145 150 155 160  
 Val Gln Asn Thr Tyr Gly Gly Pro Trp Glu Leu Ala Lys Leu Val Asn  
 165 170 175  
 Glu Ala His Lys Arg Gly Ile Ala Val Ile Leu Asp Val Val Tyr Asn  
 180 185 190  
 His Ile Gly Pro Glu Gly Asn Tyr Leu Leu Gly Leu Gly Pro Tyr Phe  
 195 200 205  
 Ser Asp Arg Tyr Lys Thr Pro Trp Gly Leu Thr Phe Asn Phe Asp Asp  
 210 215 220  
 Arg Gly Cys Asp Gln Val Arg Lys Phe Ile Leu Glu Asn Val Glu Tyr  
 225 230 235 240  
 Trp Phe Lys Thr Phe Lys Ile Asp Gly Leu Arg Leu Asp Ala Val His  
 245 250 255  
 Ala Ile Phe Asp Asn Ser Pro Lys His Ile Leu Gln Glu Ile Ala Glu  
 260 265 270  
 Lys Ala His Gln Leu Gly Lys Phe Val Ile Ala Glu Ser Asp Leu Asn  
 275 280 285  
 Asp Pro Lys Ile Val Lys Asp Asp Cys Gly Tyr Lys Ile Asp Ala Gln  
 290 295 300  
 Trp Val Asp Asp Phe His His Ala Val His Ala Phe Ile Thr Lys Glu  
 305 310 315 320  
 Lys Asp Tyr Tyr Tyr Gln Asp Phe Gly Arg Ile Glu Asp Ile Glu Lys  
 325 330 335  
 Thr Phe Lys Asp Val Phe Val Tyr Asp Gly Lys Tyr Ser Arg Tyr Arg  
 340 345 350  
 Gly Arg Thr His Gly Ala Pro Val Gly Asp Leu Pro Pro Arg Lys Phe  
 355 360 365  
 Val Val Phe Ile Gln Asn His Asp Gln Val Gly Asn Arg Gly Asn Gly  
 370 375 380  
 Glu Arg Leu Ser Ile Leu Thr Asp Lys Thr Thr Tyr Leu Met Ala Ala  
 385 390 395 400



Thr Leu Tyr Ile Leu Ser Pro Tyr Ile Pro Leu Ile Phe Met Gly Glu  
 405 410 415  
 Glu Tyr Tyr Glu Thr Asn Pro Phe Phe Phe Phe Ser Asp Phe Ser Asp  
 420 425 430  
 Pro Val Leu Ile Lys Gly Val Arg Glu Gly Arg Leu Lys Glu Asn Asn  
 435 440 445  
 Gln Met Ile Asp Pro Gln Ser Glu Glu Ala Phe Leu Lys Ser Lys Leu  
 450 455 460  
 Ser Trp Lys Ile Asp Glu Glu Val Leu Asp Tyr Tyr Lys Gln Leu Ile  
 465 470 475 480  
 Asn Ile Arg Lys Arg Tyr Asn Asn Cys Lys Arg Val Lys Glu Val Arg  
 485 490 495  
 Arg Glu Gly Asn Cys Ile Thr Leu Ile Met Glu Lys Ile Gly Ile Ile  
 500 505 510  
 Ala Ser Phe Asp Asp Ile Val Ile Asn Ser Lys Ile Thr Gly Asn Leu  
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<210> 9  
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 <212> PRT  
 <213> Sulfolobus solfataricus

<400> 9  
 Val Ile Arg Glu Ala Lys  
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<210> 10  
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 <212> PRT  
 <213> Sulfolobus solfataricus

<400> 10  
 Ile Ser Ile Arg Gln Lys  
 1 5

<210> 11  
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<400> 11  
 Ile Ile Tyr Val Glu  
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 <212> PRT  
 <213> Sulfolobus solfataricus

<400> 12  
 Met Leu Tyr Val Lys  
     1                    5

<210> 13  
 <211> 7  
 <212> PRT  
 <213> Sulfolobus solfataricus

<400> 13  
 Ile Leu Ser Ile Asn Glu Lys  
     1                    5

<210> 14  
 <211> 7  
 <212> PRT  
 <213> Sulfolobus solfataricus

<400> 14  
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<210> 15  
 <211> 10  
 <212> PRT  
 <213> Sulfolobus solfataricus

<400> 15  
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<210> 16  
 <211> 12  
 <212> PRT  
 <213> Sulfolobus solfataricus

<400> 16  
 Met Ile Ile Gly Thr Tyr Arg Leu Gln Leu Asn Lys  
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<210> 17  
 <211> 9

<212> PRT  
 <213> Sulfolobus solfataricus

<400> 17  
 Val Ala Val Leu Phe Ser Pro Ile Val  
       1                  5

<210> 18  
 <211> 11  
 <212> PRT  
 <213> Sulfolobus solfataricus

<400> 18  
 Ile Asn Ile Asp Glu Leu Ile Ile Gln Ser Lys  
       1                  5                  10

<210> 19  
 <211> 12  
 <212> PRT  
 <213> Sulfolobus solfataricus

<400> 19  
 Glu Leu Gly Val Ser His Leu Tyr Leu Ser Pro Ile  
       1                  5                  10

<210> 20  
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 <212> PRT  
 <213> Sulfolobus solfataricus

<400> 20  
 Asp Glu Val Phe Arg Glu Ser  
       1                  5

<210> 21  
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<400> 21  
 Asp Tyr Phe Lys  
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<210> 22  
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<400> 22  
 Asp Gly Leu Tyr Asn Pro Lys  
       1                  5

<210> 23  
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<400> 23  
Asp Ile Asn Gly Ile Arg Glu Cys  
1 5

<210> 24  
<211> 7  
<212> PRT  
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<400> 24  
Asp Phe Glu Asn Phe Glu Lys  
1 5

<210> 25  
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<212> PRT  
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<400> 25  
Asp Leu Leu Arg Pro Asn Ile  
1 5

<210> 26  
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<212> PRT  
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<400> 26  
Asp Ile Ile Glu Asn  
1 5

<210> 27  
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<212> PRT  
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<400> 27  
Asp Asn Ile Glu Tyr Arg Gly  
1 5

<210> 28  
<211> 18  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence: Primer

<400> 28  
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18

<210> 29  
<211> 20  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence: Primer

<400> 29  
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20

<210> 30  
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<212> PRT  
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<400> 30  
Arg Asn Pro Glu Ala Tyr Thr Lys  
1 5

<210> 31  
<211> 9  
<212> PRT  
<213> Sulfolobus solfataricus

<400> 31  
Asp His Val Phe Gln Glu Ser His Ser  
1 5

<210> 32  
<211> 8  
<212> PRT  
<213> Sulfolobus solfataricus

<400> 32  
Ile Thr Leu Asn Ala Thr Ser Thr  
1 5

<210> 33  
<211> 6  
<212> PRT  
<213> Sulfolobus solfataricus

<400> 33  
Ile Ile Ile Val Glu Lys  
1 5

<210> 34  
<211> 11

<212> PRT

<213> Sulfolobus solfataricus

<400> 34

Leu Gln Gln Tyr Met Pro Ala Val Tyr Ala Lys  
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<210> 35

<211> 5

<212> PRT

<213> Sulfolobus solfataricus

<400> 35

Asn Met Leu Glu Ser  
1 5

<210> 36

<211> 13

<212> PRT

<213> Sulfolobus solfataricus

<400> 36

Lys Ile Ser Pro Asp Gln Phe His Val Phe Asn Gln Lys  
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<210> 37

<211> 8

<212> PRT

<213> Sulfolobus solfataricus

<400> 37

Gln Leu Ala Glu Asp Phe Leu Lys  
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<210> 38

<211> 10

<212> PRT

<213> Sulfolobus solfataricus

<400> 38

Lys Ile Leu Gly Phe Gln Glu Glu Leu Lys  
1 5 10

<210> 39

<211> 10

<212> PRT

<213> Sulfolobus solfataricus

<400> 39

Ile Ser Val Leu Ser Glu Phe Pro Glu Glu  
1 5 10

<210> 40  
 <211> 9  
 <212> PRT  
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<400> 40  
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<210> 41  
 <211> 8  
 <212> PRT  
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<400> 41  
 Glu Val Gln Ile Asn Glu Leu Pro  
 1 5

<210> 42  
 <211> 5  
 <212> PRT  
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<400> 42  
 Asp His Ser Arg Ile  
 1 5

<210> 43  
 <211> 6  
 <212> PRT  
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<400> 43  
 Asp Leu Arg Tyr Tyr Lys  
 1 5

<210> 44  
 <211> 14  
 <212> PRT  
 <213> Sulfolobus solfataricus

<400> 44  
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<210> 45  
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 <212> PRT  
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<400> 45  
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 1 5 10

<210> 46  
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<400> 46  
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 1 5

<210> 47  
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 <212> PRT  
 <213> Sulfolobus solfataricus

<400> 47  
 Asp Val Phe Val Tyr Asp Gly  
 1 5

<210> 48  
 <211> 19  
 <212> PRT  
 <213> Sulfolobus solfataricus

<400> 48  
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Val Asn Pro

<210> 49  
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 <212> PRT  
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<400> 49  
 Leu Asp Tyr Leu Lys  
 1 5

<210> 50  
 <211> 17  
 <212> PRT  
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<400> 50  
 Lys Arg Glu Ile Pro Asp Pro Ala Ser Arg Tyr Gln Pro Leu Gly Val  
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His



<210> 51  
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 <212> PRT  
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<400> 51  
 Lys Asp Val Phe Val Tyr Asp Gly Lys  
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<210> 52  
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 <212> PRT  
 <213> Sulfolobus solfataricus

<400> 52  
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<210> 53  
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 <212> PRT  
 <213> Sulfolobus solfataricus

<400> 53  
 Lys Leu Trp Ala Pro Tyr Val Asn Ser Val  
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<210> 54  
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 <212> PRT  
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<400> 54  
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<210> 55  
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 <213> Sulfolobus solfataricus

<400> 55  
 Asp Tyr Tyr Tyr Gln Asp Phe Gly Arg Ile Glu Asp Ile Glu  
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<210> 56  
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 <212> PRT  
 <213> Sulfolobus solfataricus

<400> 56  
 Lys Ile Asp Ala Gln Trp Val  
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<210> 57  
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 <212> DNA  
 <213> Artificial Sequence

<220>  
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<210> 58  
 <211> 24  
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<220>  
 <223> Description of Artificial Sequence: Primer

<400> 58  
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 Asp Glu Phe Arg Glu Ser  
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<210> 60  
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 <212> PRT  
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<400> 60  
 Asp Asn Ile Glu Tyr Arg Gly  
 1 5

<210> 61  
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 Pro Ala Ser Arg Tyr Gln Pro  
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 <212> PRT  
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<400> 62  
 Asp Val Phe Val Tyr Asp Gly Lys  
 1 5

<210> 63  
 <211> 559  
 <212> PRT  
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<400> 63  
 Met Thr Phe Ala Tyr Lys Ile Asp Gly Asn Glu Val Ile Phe Thr Leu  
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 Leu Tyr Glu Met Glu Arg Asp Glu Lys Gly Tyr Phe Thr Ile Thr Leu  
 35 40 45  
 Asn Asn Val Lys Val Arg Asp Arg Tyr Lys Tyr Val Leu Asp Asp Ala  
 50 55 60  
 Ser Glu Ile Pro Asp Pro Ala Ser Arg Tyr Gln Pro Glu Gly Val His  
 65 70 75 80  
 Gly Pro Ser Gln Ile Ile Gln Glu Ser Lys Glu Phe Asn Asn Glu Thr  
 85 90 95  
 Phe Leu Lys Lys Glu Asp Leu Ile Ile Tyr Glu Ile His Val Gly Thr  
 100 105 110  
 Phe Thr Pro Glu Gly Thr Phe Glu Gly Val Ile Arg Lys Leu Asp Tyr  
 115 120 125  
 Leu Lys Asp Leu Gly Ile Thr Ala Ile Glu Ile Met Pro Ile Ala Gln  
 130 135 140  
 Phe Pro Gly Lys Arg Asp Trp Gly Tyr Asp Gly Val Tyr Leu Tyr Ala  
 145 150 155 160  
 Val Gln Asn Ser Tyr Gly Gly Pro Glu Gly Phe Arg Lys Leu Val Asp  
 165 170 175  
 Glu Ala His Lys Lys Gly Leu Gly Val Ile Leu Asp Val Val Tyr Asn  
 180 185 190  
 His Val Gly Pro Glu Gly Asn Tyr Met Val Lys Leu Gly Pro Tyr Phe  
 195 200 205  
 Ser Gln Lys Tyr Lys Thr Pro Trp Gly Leu Thr Phe Asn Phe Asp Asp  
 210 215 220

Ala Glu Ser Asp Glu Val Arg Lys Phe Ile Leu Glu Asn Val Glu Tyr  
 225 230 235 240  
 Trp Ile Lys Glu Tyr Asn Val Asp Gly Phe Arg Leu Asp Ala Val His  
 245 250 255  
 Ala Ile Ile Asp Thr Ser Pro Lys His Ile Leu Glu Glu Ile Ala Asp  
 260 265 270  
 Val Val His Lys Tyr Asn Arg Ile Val Ile Ala Glu Ser Asp Leu Asn  
 275 280 285  
 Asp Pro Arg Val Val Asn Pro Lys Glu Lys Cys Gly Tyr Asn Ile Asp  
 290 295 300  
 Ala Gln Trp Val Asp Asp Phe His His Ser Ile His Ala Tyr Leu Thr  
 305 310 315 320  
 Gly Glu Arg Gln Gly Tyr Tyr Thr Asp Phe Gly Asn Leu Asp Asp Ile  
 325 330 335  
 Val Lys Ser Tyr Lys Asp Val Phe Val Tyr Asp Gly Lys Tyr Ser Asn  
 340 345 350  
 Phe Arg Arg Lys Thr His Gly Glu Pro Val Gly Glu Leu Asp Gly Cys  
 355 360 365  
 Asn Phe Val Val Tyr Ile Gln Asn His Asp Gln Val Gly Asn Arg Gly  
 370 375 380  
 Lys Gly Glu Arg Ile Ile Lys Leu Val Asp Arg Glu Ser Tyr Lys Ile  
 385 390 395 400  
 Ala Ala Ala Leu Tyr Leu Leu Ser Pro Tyr Ile Pro Met Ile Phe Met  
 405 410 415  
 Gly Glu Glu Tyr Gly Glu Glu Asn Pro Phe Tyr Phe Phe Ser Asp Phe  
 420 425 430  
 Ser Asp Ser Lys Leu Ile Gln Gly Val Arg Glu Gly Arg Lys Lys Glu  
 435 440 445  
 Asn Gly Gln Asp Thr Asp Pro Gln Asp Glu Ser Thr Phe Asn Ala Ser  
 450 455 460  
 Lys Leu Ser Trp Lys Ile Asp Glu Glu Ile Phe Ser Phe Tyr Lys Ile  
 465 470 475 480  
 Leu Ile Lys Met Arg Lys Glu Leu Ser Ile Ala Cys Asp Arg Arg Val  
 485 490 495  
 Asn Val Val Asn Gly Glu Asn Trp Leu Ile Ile Lys Gly Arg Glu Tyr  
 500 505 510  
 Phe Ser Leu Tyr Val Phe Ser Lys Ser Ser Ile Glu Val Lys Tyr Ser  
 515 520 525

Gly	Thr	Leu	Leu	Leu	Ser	Ser	Asn	Asn	Ser	Phe	Pro	Gln	His	Ile	Glu
530						535					540				
Glu	Gly	Lys	Tyr	Glu	Phe	Asp	Lys	Gly	Phe	Ala	Leu	Tyr	Lys	Leu	
545					550					555					